

### CLAIMS:

1. A method of carrying out chemical reactions at specific temperatures, the method comprising:

applying energy to reactants in a vessel using a source other than conduction

5 heating of the vessel or the reactants;

while concurrently cooling the vessel by conduction by contacting the exterior of the vessel with a fluid.

2. A method according to Claim 1 wherein the step of applying energy comprises

10 exposing the vessel and reactants to electromagnetic radiation selected from the group consisting of microwaves, infrared, visible and ultraviolet radiation.

3. A method according to Claim 1 wherein the step of providing the flow of conduction fluid comprises directing a flow of air from the instrument to the vessel.

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4. A method according to Claim 3 comprising directing the flow of air from a fan.

5. A method according to Claim 3 comprising directing compressed air to the

20 vessel.

6. A method of carrying out chemical reactions, the method comprising:

applying energy to reactants in a vessel in an instrument that uses a source other than conduction heating of the vessel or the reactants to heat the reactants;

25 concurrently cooling the vessel in the instrument by providing a flow of conduction fluid against the vessel in the instrument;

concurrently monitoring the temperature of the vessel or its contents in the instrument;

adjusting the heating source to maintain the desired temperature at the cooling  
30 capacity that the instrument can provide to the vessel.

7. A method according to Claim 6 wherein the step of applying energy comprises exposing the vessel and reactants to electromagnetic radiation.

8. A method according to Claim 7 comprising exposing the vessel and reactants  
5 to electromagnetic radiation having frequencies selected from the group consisting of microwaves, infrared, visible and ultraviolet radiation.

9. A method according to Claim 6 wherein the step of providing the flow of conduction fluid comprises directing a flow of air from the instrument to the vessel.  
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10. A method according to Claim 9 comprising directing the flow of air from a fan.

11. A method according to Claim 9 comprising directing compressed air to the  
15 vessel.

12. A method according to Claim 6 wherein the step of monitoring the temperature comprises monitoring the temperature without interfering with the concurrent heating and cooling steps.  
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13. A method of carrying out multi-step chemical reactions, the method comprising:  
applying energy to reactants in a vessel in an instrument that uses a source other than conduction heating of the vessel or the reactants to heat the reactants to a first set  
25 point;  
concurrently cooling the vessel in the instrument by providing a flow of conduction fluid against the vessel in the instrument;  
thereafter applying energy to the reactants in the vessel to heat the reactants to a second set point to thereby initiate a second step reaction;  
30 concurrently cooling the vessel in the instrument by providing a flow of conduction fluid against the vessel in the instrument;

concurrently monitoring the temperature and adjusting the heat source during each step to thereby maintain the desired temperature by maximizing the microwave power at the capacity of the cooling source.

5           14. The method of Claim 13 further comprising the step of applying energy to the reactants in the vessel to heat the reactants to a third set point to thereby initiate a third step reaction.

15           15. The method of Claim 13 wherein the step of applying energy comprises  
10 exposing the vessels and reactants to electromagnetic radiation.

16. A method according to Claim 15 comprising exposing the vessel and reactants to electromagnetic radiation having frequencies selected from the group consisting of microwaves, infrared, visible, and ultraviolet radiation.

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17. A method according to Claim 13 wherein the steps of providing the flow of conduction fluid comprises directing a flow of air selected from the group consisting of compressed air and air from a fan from the instrument to the vessel.

20           18. A method according to Claim 13 wherein said second set point is lower than said first set point.

19. A method according to Claim 14 wherein each of said set points represents a temperature different from each of said other set points.

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20. A method according to Claim 13 wherein the step of monitoring the temperature comprises monitoring the temperature without interfering with the concurrent heating and cooling steps.